

## HOW TO CONTROL 40 COMMON INVASIVE PLANTS

Species chosen by the authors of NCHRP 14-16 are described with specific treatments for each, including effective chemical and non-chemical controls. See the NCHRP document for specific methods, rates and timing. Other references are available for identification of species in the field.

### AUTUMN OLIVE, (*Elaeagnus umbellata*)

- Chemical control: triclopyr, glyphosate, dicamba and 2,4-D.
- Non-chemical: Pull seedlings; cut trees and treat, or girdle.

### BERMUDAGRASS, (*Cynodon dactylon*)

- Chemical control: fluazifop, glyphosate, sethoxydim.
- Non-chemical: cultivate 2-3 times and remove vegetative parts.
- Shading by other plants and/or mulches to suppress growth.

### BIRDSFOOT TREFOIL, (*Lotus corniculatus*)

- Chemical control: aminopyralid, clopyralid, 2,4-D, triclopyr.
- Resistant to glyphosate.
- Non-chemical: repeated clipping reduces seeds and weakens roots.

### BLACK LOCUST, (*Robinia pseudoacacia*)

- Chemical control: glyphosate, triclopyr, picloram or fosamine.
- Non-chemical: mechanical cutting or girdling only if repeated or herbiciding fresh-cut stems. The black locust borer does damage in its native Appalachian region. No USDA approved biocontrols exist.

### BUFFELGRASS, (*Pennisetum ciliare*)

- Chemical control: fluazifop, glyphosate, hexazinone, or tebuthiuron.
- Non-chemical: mowing and burning in combination with herbicide.
- Heavy grazing makes plant susceptible to chemical treatment or drought.

### CANADA THISTLE, (*Cirsium arvense*)

- Chemical control: aminopyralid, chlor sulfuron, clopyralid (+), dicamba, glyphosate, metsulfuron methyl, picloram, triclopy (+).
- Non-chemical: repeated mechanical methods; multiple mowings, sheep and goat grazing reduces seed production, well-timed burning with other; competitive plantings, and several bio-controls.

### CHEATGRASS/DOWNY BROME, (*Bromus tectorum*)

- Chemical control: atrazine, fluazifop, glyphosate, imazapic, paraquat, pronamide, quizalofop, sethoxydim, sulfometuron.
- Non-chemical: shallow disking after germination; burning (after plants have dried only); moderate grazing and revegetation with competitive species in combination.

### CHINESE TALLOWTREE, (*Sapium sebiferum*)

- Chemical control: glyphosate, triclopyr, imazapyr, fosamine, or hexazinone.
- Non-chemical: cut trees at ground level and treat resprouts.

### COGONGRASS/SPEARGRASS, (*Imperata cylindrical*)

- Chemical control: fluazifop, glyphosate(+), or imazapyr.
- Non-chemical: tillage or mowing in combination with herbicide.
- Revegetation after control and burning prior to herbicide.

COMMON BUCKTHORN, (*Rhamnus cathartica*)

- Chemical control: glyphosate, triclopyr, fosamine, picloram, or hexazinone.
- Non-chemical: pulling, mowing with herbicide of re-sprouts.

COMMON REED, (*Phragmites australis*)

- Chemical control: glyphosate, imazapyr, fluazifop-P.
- Non-chemical: cutting and flooding possible on some sites.

CROWNVETCH/TRAILING, (*Coronilla varia*)

- Chemical control: aminopyralid, clopyralid, 2,4-D, glyphosate, metsulfuronmethyl, and triclopyr.
- Non-chemical: remove manually or by cutting or burning, then treat cut stems; revegetation, late spring prescribed burns, grazing in combination only.

DIFFUSE KNAPWEED, (*Centaurea diffusa*)

- Chemical control: aminopyralid, clopyralid (+), e,4-D, dicamba (+), glyphosate, picloram (+).
- Non-chemical: mowing before seed set, minimize disturbances, 2 years of prescribed burning, livestock grazing, and numerous biocontrol insects.

DYERS WOAD, (*Isatis tinctoria*)

- Chemical control: chlorsulfuron, 2,4-D, metsulfuron methyl.
- Non-chemical: mowing is not effective; or a native rust fungus reduces seed.

GIANT HOGWEED, (*Heracleum mantegazzianum*)

- Chemical control: glyphosate, triclopyr, simazine, imazapic, imazapyr.
- Non-chemical: 2-3 mowings during growing season for a few years; or deep cultivation to kill plants.

HOARY CRESS/WHITETOP, (*Cardaria draba*)

- Chemical control: chlorsulfuron, 2,4-D, dicamba(+), glyphosate, MCPA, metsul furonmethyl, sulfometuron methyl.
- Non-chemical: repeated cultivation and clean equipment; sheep and goat grazing; flooding for 2 months; mowing with competitive cropping.

JAPANESE KNOTWEED, (*Polygonum cuspidatum/Fallopia japonica*)

- Chemical control: glyphosate, triclopyr, or imazapyr.
- Non-chemical: mowing followed by herbicide.

JAPANESE STILTGRASS, (*Microstegium vimineum*)

- Chemical control: fluazifop, glufosinate, glyphosate, imazapic, oryzalin, pendimethalin, prodiamine, sethoxydim, or oxadiazon (+).
- Non-chemical: mowing does not control; burning to remove litter to improve herbicide only.

JOHNSONGRASS, (*Sorghum halepense*)

- Chemical control: glyphosate, fluazifop-P, clethodim, sethoxydim.
- Non-chemical: repeated close mowings or tillage.

KOCHIA, (*Kochia scoparia*)

- Chemical control: bromacil (+), chlorsulfuron, (+), 2,4-D, dicamba, diuron, fluroxypyr, glyphosate, hexazinone, imazapic, MCPA, metsulfuron methyl or simazine.

- Non-chemical: shallow tillage or propane flamer on emerging seedlings.

#### KUDZU, (*Pueraria lobata*)

- Chemical control: picloram, clopyralid, glyphosate, metsulfuron, fosamine, dicamba, or tebuthiuron
- Non-chemical: well-timed cutting, mowings, or disking for large areas. A fungus biocontrol is being studied in Mississippi.

#### LEAFY SPURGE, (*Euphorbia esula*)

- Chemical control: 2,4-D, dicamba (+), glyphosate, imazapic, imazapyr, and picloram (+).
- Non-chemical: 2 fall cultivations, grubbing or pulling, mow with herbicide, goats and sheep grazing, many biocontrols available.

#### MEDUSAHEAD RYE, (*Taeniatherum caput-medusae*)

- Chemical control: imazapic, glyphosate (+), sulfometuron, atrazine, or paraquat.
- Non-chemical: mowing not effective, heavy grazing by sheep reduces only.

#### MULTIFLORA ROSE, (*Rosa multiflora*)

- Chemical control: glyphosate, triclopyr, dicamba, fosamine, metsulfuron, picloram, or tebuthiuron.
- Non-chemical: 3-6 mowings or cuttings annually, a biocontrol shows promise.

#### MUSKTHISTLE, (*Carduus nutans*)

- Chemical control: aminopyralid, chlorsulfuron, clopyralid, clopyralid (+), 2,4-D, dicamba, pglyphosate, metsulfuronmethyl, picloram, triclopyr (+).
- Non-chemical: cultivation, manual cutting, mowing, sheep and goat grazing, well-timed flamer, and healthy established grasses.

#### PERENNIAL PEPPERWEED/WHITETOP, (*Lepidium latifolium*)

- Chemical control: chlorsulfuron 2,4-D, glyphosate, imazamox, imazapyr, imazethapyr, or metsulfuron methyl.
- Non-chemical: mowing at flower bud with herbicide follow-up; goat and sheep grazing, or possible seasonal flooding.

#### PRIVET, (*Ligustrum sp.*)

- Chemical control: glyphosate, triclopyr, imazapyr, triclopyr, or metsulfuron.
- Non-chemical: small populations can be pulled or repeatedly mowed.

#### PUNCTUREVINE, (*Tribulus terrestris*)

- Chemical control: chlorsulfuron, 2,4-D, dicamba, dichlobenil, glyphosate, imazapyr, MCPA, oryzalin, or paraquat.
- Non-chemical: planting competitive vegetation, biocontrols of a stem weevil and a seed weevil are effective.

#### REED CANARYGRASS, (*Phalaris arundinacea*)

- Chemical control: fluazifop, glyphosate, or sulfometuron.
- Non-chemical: early season grazing, prescribed fire, and repeated mowings are effective with chemical follow-up; competitive plantings.

#### RUSSIAN KNAPWEED, (*Acroptilon repens L.*)

- Chemical control: aminopyralid, chlorsulfuron, clopyralid (+ 2,4-D), dicamba (+), glyphosate, metsulfuronmethyl, picloram, triclopyr+ chorpyralid.
- Non-chemical: disking, summer mowing, competitive crop, and biocontrol agents.

#### RUSSIAN THISTLE/TUMBLEWEED, (*Salsola tragus*)

- Chemical control: atrazine, bromacil, bromoxynil, chlorsulfuron, w,4-D, dicamba diuron, glyphosate, hexazinone, isoxaben, simazine, sulfometuron, and triclopyr.
- Non-chemical: pulling, mowing before seed set; competitive perennial grasses; monitor fences and washes for piles of weed seed; two biocontrols available.

#### RUSSIAN OLIVE, (*Elaeagnus angustifolia*)

- Chemical control: triclopyr, glyphosate, imazapyr, metsulfuron, via foliar, soilapplied, cut stump, hack and squirt, or basal applications.
- Non-chemical: pulling of seedlings and saplings up to 3.5" with follow-up, mowing or cutting with herbicide, prescribed hot burn, and natural controls.

#### SALT CEDAR/TAMARISK, (*Tamarix spp.*)

- Chemical control: imazapyr (+), or triclopyr.
- Non-chemical: avoid disturbance, a biocontrol leaf beetle has impact.

#### SMOOTH BROME, (*Bromus inermis*)

- Chemical control: fluazifop, glyphosate, imazapic, pronamide.
- Non-chemical: A single well-timed mowing in boot stage, burning can control spread but not eliminate smooth brome.

#### SPOTTED KNAPWEED, (*Centaurea biebersteinii*)

- Chemical control: aminopyralid, clopyralid (+), 2,4-D, dicamba, picloram.
- Non-chemical: mowing at late bud, avoid fertilizers, minimize disturbances, sheep and goat grazing long term, and a number of biocontrols.

#### TALL FESCUE, (*Festuca arundinacea*)

- Chemical control: glyphosate, imazapic, and imazapyr.
- Non-chemical: several mowings plus herbicide, several spring burns.

#### TARTARIAN HONEYSUCKLE, (*Lonicera tatarica*)

- Chemical control: glyphosate, triclopyr, fosamine, or metsulfuron.
- Non-chemical: pulling or grubbing, clip in spring and summer, or spring prescribed burn in fire-adapted communities.

#### TREE OF HEAVEN, (*Ailanthus altissima*)

- Chemical controls: glyphosate, triclopyr, diuron, imazapyr (+).
- Non-chemical: hand-pulling of seedlings only, no biocontrols.

#### TROPICAL SODA APPLE, (*Solanum vaiaurum*)

- Chemical control: aminopyralid, glyphosate, picloram (+), triclopyr (+).
- Non-chemical: spring mowing plus herbicide, one potential biocontrol.

#### YELLOW STAR THISTLE, (*Centaurea solstitialis* L.)

- Chemical control: aminopyralid, chlorsulfuron, clopyralid, e,4-D, dicamba, glyphosate, picloram, sulfometuron, triclopyr.
- Non-chemical: all mechanical methods to prevent seed for 2-3 years; reseed with perennial grasses; intense grazing; and several biocontrol agents.

\*Control suggestions are excerpted with permission from: Ian Heap, Joe DiTomaso, and Dave Nelson, 2009. *Guidelines for Roadside Vegetation Management* NCHRP Project 14-16, Transportation Research Board of the National Academies, Washington D.C.